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creased pressure, corresponding to a rise in the boiling point of carbon. The radiation from the crater was measured with a radiomicrometer. Since the radiation varies as the fourth power of the temperature, a slight change in the latter should be noticeable. The experiments were not definitive, on account of the many difficulties encountered, but seemed to show that the temperature remained constant throughout a range of pressure of from one to seven atmospheres. At any rate, the constancy was sufficient to practically disprove the boiling-point idea. Among the chief difficulties to be met were connection currents in the apparatus, which rendered the gases so opaque as to suggest to the writers a new explanation of sun spots. The paper has the additional interest of indicating that temperature effects can not play an important part in the shifting of lines in metallic spectra when pressure is applied to the arc.

Preliminary Table of Solar Spectrum Wavelengths, XVII.: By HENRY A. ROWLAND.

On the Comparative Value of Refracting and Reflecting Telescopes for Astrophysical Investigations: By GEORGE E. HALE. The paper, as is indicated by the title, is a discussion of the relative merits of the two forms of instruments mentioned. In addition to economy, freedom from chromatic aberration, and other advantages sometimes urged in favor of reflectors, Professor Hale brings forward that of their relative freedom from absorption. The effect of this in large refractors is discussed in the above paper by Dr. Vogel, and is shown to increase with the size. Since the percentage of absorption of a reflector is independent of its dimensions, this factor is of great importance where large apertures are concerned. The paper is accompanied by an interesting diagram, which shows, among other things, that for linear apertures greater than 90 cm. the *photographic* [light-gathering power of a reflector exceeds that of a refractor.

On a New Form of Mounting for Reflecting Telescopes Devised by the Late Arthur Cowper Ranyard: By F. L. O. WADSWORTH. The writer discusses some developments of the idea of the Cassegrainian Condé proposed by Mr. Ranyard. Several forms of mounting are considered. In every case, with one exception,

the polar axis is of the fork type. A mirror at the intersection of the polar and declination axis is so arranged that its plane always bisects the angle between the telescope and polar axis, so that light from the small convex mirror is always thrown up or down the polar axis (which is hollow), as may be desired.

A Support System for Large Specula: By G. W. RITCHEY. In this article Mr. Ritchey describes a support system designed to reduce to a minimum the effects of flexure in large mirrors. The system is in reality a double one: 1. The back support. 2. The edge support. In the first system the mirror is considered as divided, by cylindrical surfaces perpendicular to the back of the mirror, into twelve parts of equal mass. Each part rests upon a support. Nine of these supports are counterbalanced in all positions by weighted levers, while the remaining three rest upon the cell. It is evident that if all twelve supports were counterbalanced the mirror would be in equilibrium in any position close to its normal one. If three of the supports are fixed, however, the nine remaining counterweights will be unable to take any of the weight off of the fixed supports which will, therefore, determine the plane of the mirror. The mirror will, therefore, *float* in a fixed plane. The edge support is designed upon the same general principles. There is reason to believe that the plan will combine with a perfect flotation support, a degree of stability heretofore unattained in speculum mounting.

Oxygen in the Sun: By LEWIS E. JEWELL. See foot-note to abstract of App. J, December, 1896, in SCIENCE, March 19th.

Minor Contributions and Notes, Reviews, Bibliography.

SOCIETIES AND ACADEMIES.

ZOOLOGICAL CLUB, UNIVERSITY OF CHICAGO,
MEETING FEBRUARY 10.

ABSTRACTS OF PAPERS PRESENTED.

*On the Morphology of the Skull of the Pelycosauria and the Origin of the Mammals.** By G. BAUR and E. C. CASE.

*A fuller account of this paper has just been published in *Anatom. Anzeiger*, XIII. Band., No. 2 and 5, January 30, 1897, pp. 109-120, with three figures of the skull.

The sub-order Pelycosauria was established by Professor Cope in May, 1878, for certain Reptilia, especially *Clepsydrops* and *Dimetrodon*, from the Permian of Texas. It was said to differ from the Rhynchocephalia by the absence of the quadrato-jugal arch. At the end of the same year the order *Theromorpha* was established, as distinct from the *Rhynchocephalia*, containing the suborders *Pelycosauria* and *Anomodontia* (Owen).

The characters of this order with its two suborders were given as follows:

Theromorpha, Cope. Scapular arch consisting at least of scapula, coracoid and epicoracoid which are closely united. Pelvic arch consisting of the usual three elements, which are united throughout, closing the obturator foramen and acetabulum. Limbs with the phalanges as in the ambulatory types. Quadrate bone proximally united by suture with the adjacent elements. No quadrato-jugal arch.

Pelycosauria. Two or three sacral vertebræ; centra notochordal; intercentra usually present. Dentition full.

Anomodontia. Four or five sacral vertebræ; centra not notochordal; no intercentra. Dentition very imperfect or wanting.

The order *Theromorpha* was regarded by Professor Cope as approximating the Mammalia more closely than any other division of the Reptilia, and as probably the ancestral group from which the latter were derived.

The order *Theromorpha* has been admitted by nearly all paleontologists and zoologists, and the opinion of the close relationship of this group with the Mammalia has found very many supporters.

This view is not correct. It is shown that the order *Theromorpha* has no existence. The *Pelycosauria* cannot be brought together with the *Anomodontia*, since they have both the upper (postorbito-squamosal) and lower (quadrato-jugal) arches, like the Rhynchocephalia.

This result was reached by the study of an excellent specimen of *Dimetrodon incisivus*, Cope, collected in the spring of 1896, by Dr. E. C. Case, while in charge of the field expedition of the department of paleontology of the University of Chicago.

The following conclusions were reached, after

the description of the skull and the principal portions of the skeleton:

The Affinities of the Pelycosauria.

There cannot be any doubt that *Dimetrodon* is nearest to the *Rhynchocephalia* and *Proganosauria* (*Palæohatteriidae*). The structure of the skull, the vertebral column, and the humerus are of the same type.

The specialization of the *Pelycosauria* consists in the enormous development of the neural spines of the dorsal vertebræ, and in the reduction of the upper part of the quadrate and its nearly complete inclosure by the squamosal, prosquamosal and quadrato-jugal. *It is quite evident that the Pelycosauria with the two temporal arches, and the specialized neural spines cannot be the ancestors of mammals*; they represent a specialized side branch of a line leading from the Proganosauria to the Rhynchocephalia, which becomes extinct in the Permian.

The mammals have a single temporal (zygomatic) arch; the posterior nares are placed far back, and are roofed over the maxillary and palatine plates; the quadrate is completely co-ossified with the squamosal and quadrato-jugal; the occipital condyle is double, the entepicondylar foramen is present in all the generalized forms. The ancestors of mammals must show the same condition.

Seeley has combined a number of Permian-Triassic Reptilia from South Africa into an order which he calls *Gomphodontia*. These reptiles are: *Tritylodon*, Owen (always so far considered a mammal); *Diademodon*, Seeley; *Gomphognathus*, Seeley; *Micro gomphodon*, Seeley; and *Trirachodon*, Seeley.

In *Gomphognathus* we have a double occipital condyle; the posterior nares are placed far back and are roofed over by the maxillary and pterygoid plates, and there is an entepicondylar foramen. The quadrate seems to be of the reduced form; a condition we see also in the closely related *Cynognathus*.

These forms look very much like mammals and could possibly be ancestral to them. We must suppose that the condition of the palate seen in the Mammalia and *Gomphodontia* has been developed from a type which we find among the *Rhynchocephalia*. The *Crocodylia*, where we have a palate similar to that of mam-

mals, show us how such a type of palate was developed from the Rhynchocephalia, through the Belodonts and the Teleosaurs. It is possible that the *Gomphodontia* originated from the *Proganosauria*.

We are fully convinced that among these South African forms, one of which was for a long time considered a mammal, we have those reptiles which might be considered as ancestral to the mammals or at least closely related to their ancestors. Further finds and careful critical observations have to decide this.

The Cranial Region of Dimetrodon. By E. C. CASE.

The paper presented additional evidence of the relationship of *Dimetrodon incisivus*, Cope, to the living and extinct Rhynchocephalia.

It was shown that in *Dimetrodon* there was a common distal opening of the eustachian tubes, as in the *Crocodylia* and aglossal *Anura*, and that this opening corresponded to a deep pit in the posterior part of the lower surface of the basisphenoid. There was a large hypophysis, which extended backward nearly as far as the tympanic region, and occupied an excavation of the lower part of the basioccipital, just as the hypophysis occupies an excavation in the basisphenoid in young *Crocodylia*. The tympanic region was not separated from the brain cavity by a wall of bone, but communicated freely as in fishes and some amphibians. A cast of a part of the brain cavity showed that the posterior region was very similar to the brain of *Sphaenodon*. The nerves all occupied similar positions. The cerebellum was probably thin antero-posteriorly, elongated from side to side and elevated. There was a sharp descent of the medulla in its anterior portion, forming an angle with the part anterior to it. This angle is very apparent in the brain of *Sphaenodon*, but absent in most other Reptilian brains, where the medulla is horizontal or joins the mid-brain at only a very slight angle.

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 261st regular meeting of the Society was held Tuesday evening, March 16, 1897.

Professor Thomas Wilson read a paper on

'A Cañon in Prehistoric Archæology,' in which he said that the more widely extended is the search for prehistoric man the greater will be found the area that he occupied, and the more profound the excavations the greater will be found the antiquity of that occupation. This is not meant to indicate that prehistoric man occupied all the area of the world, nor that, having once discovered his occupation of a certain area, an extension of the investigation would necessarily show an extension of the area. The theory maintained is that, having shown his occupation of a certain locality, investigations made in other localities, or in other portions of the same country, will show his increasing and wider distribution and occupation. It is a proposition announced by the foremost prehistoric archæologists that prehistoric man is not found in proportion to the number of sites occupied by him, nor by the density of his population, nor yet by the number of objects which he has left, but is, on the contrary, in proportion to the number of seekers. The world has hardly yet awakened to a just appreciation of the extent of the occupation of the earth by man during prehistoric times, nor yet to his antiquity. He used, as illustrations, the reports recently made by archæologists of investigations in two countries. The first, Babylon, has resulted in pushing the historic period back to a much greater antiquity. The other country, the prehistoric occupation of which has been doubted, if not denied, is Egypt, and is the result of investigations and excavations lately made by the Director-General of Antiquities in charge of the Gizeh Museum. He then detailed the investigations and results in these countries, exhibiting a rare collection, which he had obtained from Mr. de Morgan, the head of the Gizeh Museum, to whom the greatest credit is due for these researches.

Mr. R. T. Hill then read a paper on 'Some Phases of the Negro of the West Indies,' in which he described the geographic distribution, the difference in type, the social and political conditions of the negro in the several islands and groups of islands. Obeahism, or voodooism, is widespread in its practice and powerful in its influence, nearly all of the common people believing in Obeah, not only the blacks and

colored, which is the term applied to mulattoes, but the whites. A member of the City Council of Kingston was suspected of being a prominent Obeah man. The Obeah man is always flogged when detected in such practice. The object of this practice, or worship, as it is often called, is to: (1) Thwart or remove the spirits of the departed. (2) To bring success. (3) To punish enemies. (4) To prevent theft. They consist of sacrifices, charms, terrorizing and hypnotizing influences. To remove duffies or ghosts, a cock is sacrificed, and they hang up a bottle of water. To bring success they strew rice and other powders. To punish enemies they sacrifice a cock, cut off feet and head and plant the head with beak toward the door of the enemy. To prevent theft they hang up a bottle. The belief in duffies or ghosts is the most striking feature of Obeahism; charms are worked to keep the duffies in their graves and to keep them out of their homes. Sacrifices and practices of the most inhuman and revolting character are sometimes performed, and instances of human sacrifices were known. Every unexplainable act is credited to the duffies, and a negro will not answer a knock at his door after dark for fear it will prove a duffie. Many curious and interesting beliefs and customs were related. Discussed by Professor Mason, J. H. Blodgett, Drs. Frank Baker, J. H. McCormick and others.

J. H. MCCORMICK,
General Secretary.

NEW YORK ACADEMY OF SCIENCES; BIOLOGICAL
SECTION, MARCH 8, 1897.

THE papers presented were:

H. E. Crampton, 'On the Ascidian Half Embryo.' His experimental studies on the egg of *Molgula manhattensis* showed that the isolated blastomeres segment in a strictly 'partial' manner, but that a gradual passage to a 'total' development ensues. As far as the early stages were concerned, Chabry, Roux and Barfurth are entirely correct in arguing for a half or 'partial' development. But Driesch, Hertwig and others are also correct in considering the end result a 'total' larva of less than the normal size. The paper will be published in full.

N. R. Harrington, 'On a Nereid from Puget

Sound (Pacific coast), which lives commensally with the Hermit crab, *Eupagurus alaskensis*.' A variety of the western European species, *N. fucata*, is known to inhabit deserted whelk cells with *Eupagurus bernhardus*, and a careful comparison of the Old and the New World forms brings out resemblances in structure due to the operation of the same physiological factors. These are notably: (1) the degeneration of the muscular and cuticular layers in the posterior two-thirds of the body; (2) loss of the pigment in the same; (3) physiological factors may explain why only females are found (as yet) in this comfortable and nutritive habitat. The author surmises that the commensal form is the female epitocous type of some free living nereid.

This apparently undescribed species from the Pacific differs from *N. fucata* *B. inquilvina* of Wirén in the arrangement of the paragnathi, respiratory lobes of notopodium and transverse pigment stripes.

Bashford Dean, 'A Posthumous Memoir of Professor J. S. Newberry.' This paper described new species and a new genus of North American fossil fishes, and discussed the genera *Oracanthus*, *Dactylodus*, *Polyrhizodus*, *Sandalodus* and *Petalodus*.

Among the types were species of *Cladodus*, *Oracanthus*, *Ctenacanthus*, *Stethacanthus*, *Asteroptychius*, *Dactylodus*, *Deltodus*, *Sandalodus*, *Psephodus*, *Helodus* and *Ctenodus*. *Dinichthys corrugatus* was taken as a type of a new genus, *Stenognathus*.

At the conclusion of the papers an election of sectional officers was held. Professor E. B. Wilson was elected Chairman for the ensuing year and Professor C. L. Bristol Secretary.

BASHFORD DEAN,
Secretary pro tem.

TORREY BOTANICAL CLUB, FEBRUARY 24, 1897.

THE first paper was by Mr. Arthur Hollick, 'A fossil *Arundo* from Staten Island.' The paper was presented by Dr. Britton, with prefatory remarks referring to this discovery. Its occurrence was in yellow sand of Staten Island, belonging to late Tertiary or early Quaternary; the locality, a pit near Port Wadsworth. The preliminary reference to *Phragmites* is now changed by Mr. Hollick to the tropical genus *Arundo*.

Mr. E. O. Wooton made 'Remarks on some of the rarer Plants of New Mexico,' sketching briefly the botanical regions of New Mexico, and tracing upon a map the routes traversed by most of the botanical collectors who have visited them. Mr. Wooton was himself practically the first to make collections in the southeast section of the Territory, a very interesting, botanical region, with high mountains, some of which were illustrated by photographs. Specimens of Mr. Wooton's collecting were then shown, exhibiting about thirty-five flowering plants and ferns, and including, among those familiar in the East, *Pellaea atropurpurea*, *Cystopteris fragilis*, *Pteris aquilina* and *Cheilanthes tomentosa*.

Mr. Rydberg compared some of the features presented by the sand region of central Nebraska; referred to *Muhlenbergia pungens* and other so-called 'blow-out grasses' of the sand-hills, and described the formation of the characteristic 'blow-outs' or hollows, originating in spots where the grasses had died out and deepening rapidly, sometimes to 300 feet, producing a country where the hills are moving every year, and where he, when camping, could find no fuel except roots of sand-cherries exposed along fresh 'blow-outs.'

Dr. H. M. Richards spoke 'On Some of the Reactions of Plants Toward Injury,' as shown by his experiments in Germany last summer. Diagrams illustrating the effect of injury upon both respiration and temperature were shown. In the former case it was seen that the respiration is greatly increased by wounding, attaining its maximum about 24 hours after the injury was inflicted; this increase depending both on the stimulus of the wound itself and upon the access of atmospheric oxygen to the tissues. The occurrence of a corresponding rise in temperature, of a local nature, was also briefly referred to; the temperature curve corresponding closely to that described by the increased respiratory activity. The thermo-electric apparatus used was described; its delicacy is such as to indicate a difference of $\frac{1}{400}$ of a degree; the result with potatoes showing a maximum rise of temperature of a little over $\frac{1}{10}$ of a degree at the end of the second day, falling to the end of the fifth day. A remarkable temperature rise in the onion of nearly $3\frac{1}{2}$ degrees was explained

by the fact that here the rise was not local, but affected the whole onion, in accordance with the morphological structure, and with the fact that metabolism is carried on very fast in the onion.

The next paper was a contribution from Dr. Alexander Zahlbrückner, of Vienna, a corresponding member of the Club, entitled, 'Revisio Lobeliacearum Bolivienensium hucusque cognitatarum.' The paper, which is in Latin, enumerates all the species, giving synonymy and references to the literature, and cites collectors and their numbers. There are 39 species, as follows: 9 in *Centropogon*, 2 new; 20 in *Siphocampylos*, 7 new; 1 in *Laurentia*; 2 in *Rhizocephalum*; 3 in *Hypsela*; 4 in *Lobelia*.

EDWARD S. BURGESS,
Secretary.

NEW BOOKS.

Agriculture in some of its Relations to Chemistry.

F. H. STORER. New York, Charles Scribner's Sons. 1897. Seventh edition, revised and enlarged. Three Volumes. Pp. iv+610, iv+602, vi+679. \$5.

Stones for Building and Decoration. GEORGE

P. MERRILL. New York, John Wiley & Sons. 1897. Second edition, revised and enlarged. Pp. ix+506. \$5.

The Elements of Physics. Vol. III. *Light and Sound.* EDWARD L. NICHOLS and WILLIAM S. FRANKLIN. New York and London, The Macmillan Co. 1897. Pp. vii+201. \$1.50.

The Outlines of Physics. EDWARD L. NICHOLS. New York and London, The Macmillan Co. 1897. Pp. xi+452. \$1.40.

Hypnotism. ALBERT MOLL. London, Walter Scott, Ltd. 1897. Fourth edition, revised and enlarged. Pp. x+448. 1s 6d.

Art Education. W. T. HARRIS. Syracuse, N. Y., C. W. Bardeen. 1897. Second edition. Pp. 77. 50 cents.

Les gaz de l'atmosphère. H. HENRIET. Paris, Gauthier-villars et Fils, Masson et cie. Pp. 192.

Anleitung zur Mikrochemischen Analyse der Wichtigsten organischen Verbindungen. H. BEHRENS. Hamburg and Leipzig, Leopold Voss. 1897. Viertes Heft. Pp. vii+129. M 4.50.